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the Otto, is well known in this country. A mixture of gas and air is admitted into the cylinder and ignited, the explosion giving the motive power. The arrangement is such that the engine receives one impulse in every two revolutions; so, in order to get a steady motion, an extremely heavy fly-wheel, or a countershaft carrying a fly-wheel, is necessary. Another of the gas-engines, the Atkinson, is of rather remarkable design. There are four strokes of the piston to one revolution of the fly-wheel, and these strokes are of varying length. The stroke which takes the charge into the cylinder is 6.3 inches; the next stroke compresses the charge, and is 5 inches in length, the charge being thus compressed into a space of 1.3 inches. The compression being effected, ignition takes place, giving the working stroke, which is 11.13 inches in length. This is followed by the exhaust stroke, which sweeps the products of combustion out, and is 12.4 inches in length. The cylinder is 9.5 inches in diameter. The third of the gas-engines, the Griffin, differs from the other two in several particulars. An impulse is given to the crank-shaft for every revolution and a half. The tests were made by Professor A. C. W. Kennedy, Dr. John Hopkinson, and Mr. Beauchamp Tower. Taking first the Atkinson engine, they found that the gas consumed per indicated horse-power was 18.8 cubic feet, and per brake horse-power 22.1 cubic feet per hour. The gas used for ignition was 4.5 cubic feet per hour, making a total per brake horse-power of 22.6 cubic feet per hour. The engine ran smoothly and with regularity. The mechanical efficiency of the engine was 85 per cent, and 25.5 per cent of the whole of the heat generated was converted into work. The Otto engine used 27.4 cubic feet of gas per hour for an available horse-power. The Griffin engine used 28 feet per hour for an available horse-power. These figures show, that, as far as the cost of gas is concerned, it is more economical to use it to drive an engine, and use the power developed for electric lighting, than to burn it directly. For instance: if we take 25 cubic feet of gas per hour as the average amount consumed per horse-power by a gas-engine, then we have, by burning direct, 5 16-candle-power gaslights; with gas-engine and dynamo, 12 16-candle-power electric lights. There are at present, however, so many additional expenses incident to an isolated electric plant,—interest, depreciation, breakage, attendance, etc.,—that it is cheaper to use the gas directly. At the same time, the figures given suggest possibilities. The fourth engine tested was a Davy-Paxman steam-engine of about twenty horse-power. This gave some remarkable results. It is a compound engine, the cylinders being 5.24 and 8.98 inches in diameter, and the stroke 14 inches, the pressure used being 190 pounds. The result of one of the trials was an available horse-power for 2.08 pounds of coal per hour,—a remarkable result, considering the size of the engine. These results show, that, as far as cost of fuel alone is considered, a horse-power hour from a gas-engine, with gas at \$1.50 per thousand feet, would cost 3.75 cents; and from a Davy-Paxman engine, with coal at \$4 per ton, .8 of a cent.

ACCUMULATORS.—Judge Coxe has just rendered a decision in the United States Circuit Court for the southern district of New York, in which the Faure patent for improvements in secondary batteries or accumulators is held to cover any secondary battery in which an electrode is used having the so-called active material applied in the form of a paint, paste, or cement. The suit is entitled "The Electrical Accumulator Company vs. Julien Electric Company." The field for accumulators is very large, as shown by the fact that there are to-day no less than eight or ten companies engaged in that business. Among them are the Electrical Accumulator Company, owning the Faure patents, and the Julien, Gibson, Woodward, Pumpelly, and Macrae Companies, all of whose batteries, the Accumulator Company claims, are tributary to the Faure invention. In anticipation of a favorable decision, the Electrical Accumulator Company has already built a street-car to be propelled by means of batteries, and now has it on exhibition on Elkins & Widener's Philadelphia Traction Road in West Philadelphia. Its initial trip last Friday was a success, the car moving up a long five-per-cent grade at the rate of seven miles an hour. Brill & Co., West Philadelphia, are making six other cars to be completed in April and May; and the Electrical Accumulator Company is now prepared to occupy extensively the electric street-car field.

NOTES AND NEWS.

DR. R. W. SHUFELDT has moved from Fort Wingate, N.Mex., to Washington, D.C., where he will continue in his scientific pursuits at the Smithsonian Institution.

—The wind-pressure on the Forth bridge, or rather the effective area of a bridge exposed to a wind-pressure striking the work at different angles, was practically demonstrated by Mr. B. Baker, as described in a late lecture before the Society of Arts, as follows: a model of the bridge was made, and towed in water at different angles to the stream; the area of a flat board normal to the current was then determined, which exerted the same drag as the model; this area was then taken as the effective area of the bridge for the particular angle at which it was towed.

—M. Alfred Binet of Paris, France, will contribute to *The Open Court* (Chicago) of March 21 a paper on "Sensation and the Outer World." The article is part of an unpublished essay upon "External Perception," crowned by the Académie des Sciences Morales et Politiques. In the same number Professor Edward D. Cope of Philadelphia will present some considerations upon ethical evolution, including a review of the extent and significance of the utilitarian doctrine of morals. *The Open Court* of March 28 will contain an article by the German Sanscrit scholar, Professor H. Oldenberg, on the "Discovery of the Veda." The disclosures that this epoch-making event have led to, form the most interesting chapter in all philological science.

—The composition and evaporative power of Kansas coals have been investigated by Professor E. H. S. Bailey and Professor L. I. Blake, of the State University. The coal-measures that underlie the eastern part of the State of Kansas are being developed at the present time to a greater extent than ever before. With the increased population of the State, the introduction of important manufacturing, and the extension of so many lines of railway, there is naturally a greater demand for fuel, and a greater interest in its economic supply. In the last "Report of the State Mine Inspector" (1887), there are mentioned about a hundred shafts, in the different regions, where mining is actively carried on; besides this, there are innumerable places where coal is mined or stripped in a small way to supply the local trade. The coal-beds seem to be divided into several groups, the lowest being in the extreme south-eastern part of the State. The coals depreciate in their steam-producing powers from the south-eastern part of the State toward the north and west. Professor Bailey finds they depreciate in the amounts of fixed carbon in a similar order.

—The Johns Hopkins Hospital will be opened to the inspection of the public, before the reception of patients, during the week beginning May 6, 1889. On Tuesday, May 7, at 11 o'clock in the morning, there will be appropriate addresses in the main administration building. Invitations to be present will be sent to the authorities of the city and State, to those who have rendered special services in promoting the plans of the hospital, to professors of medicine and surgery, to the chief managers of other hospitals, and to the representatives of the press. On Wednesday, May 8, between the hours of 12 and 6 o'clock, the buildings will be open to the medical profession of Baltimore, Washington, and the State of Maryland, to medical students, to the managers of the benevolent institutions of Baltimore, to the ministers of all religious denominations, and to other persons whose pursuits have led them to take a special interest in hospital-work. Cards of admission will be distributed in advance. On Thursday, May 9, and Friday, May 10, between the hours of 12 and 6 o'clock, the public generally will be invited to visit the hospital. Cards of admission may be obtained, on the days named, at the entrance-gate of the hospital, Broadway. On Saturday, May 11, the faculties of the various institutions in Baltimore, the teachers of public and private schools of every kind, the students of the Johns Hopkins University, the Baltimore City College, the State Normal School, the Woman's College of Baltimore, and the Eastern and Western Female High Schools, will be admitted between the hours of 10 and 6 o'clock upon the presentation of tickets, which will be distributed in advance. The dispensary will be opened for the treatment of out-door patients, Monday, May 13, at 10 o'clock. The hospital will be opened soon afterwards for the treatment of patients.